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FURUNO®

Installation Manual
MARINE RADAR MODEL 1622

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NISHINOMIYA, JAPAN

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(DAMI)

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SAFETY INSTRUCTIONS

⚠ WARNING



ELECTRICAL SHOCK HAZARD

Do not open the equipment unless totally familiar with electrical circuits and service manual.

Only qualified personnel should work inside the equipment.



Wear a safety belt and hard hat when working on the antenna unit.

Serious injury or death can result if someone falls from the radar antenna mast.

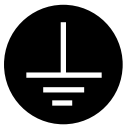
Construct a suitable service platform from which to install the antenna unit.

Serious injury or death can result if some-one falls from the radar antenna mast.

Turn off the power at the mains switch-board before beginning the installation.

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

⚠ CAUTION



Ground the equipment to prevent electrical shock and mutual interference.

Observe the following compass safe distances to prevent interference to a magnetic compass:

	Standard compass	Steering compass
Display unit	0.65 m	0.5 m
Antenna unit	1.25 m	0.95 m

EQUIPMENT LISTS

Standard Supply

NAME	TYPE	CODE NO.	QTY	REMARKS
Antenna Unit	RSB-0060-068	–	1	
Display Unit	RDP-125-E	–	1	
Installation Materials	CP03-16500	000-086-761	1 set	No antenna cable
	CP03-16510	000-086-762		5 m antenna cable
	CP03-16520	000-086-763		10 m antenna cable
	CP03-16530	000-086-764		15 m antenna cable
	CP03-16540	000-086-765		20 m antenna cable
Spare Parts	SP03-09800	000-085-441	1 set	

Installation Materials

NAME	TYPE	CODE NO.	QTY	REMARKS
Antenna Cable (5 m)	MJ-A10SPF0003-050	000-129-608	1	Select one, connector at both ends
Antenna Cable (10 m)	MJ-A10SPF0003-100	000-129-609		
Antenna Cable (15 m)	MJ-A10SPF0003-150	000-129-611		
Antenna Cable (20 m)	MJ-A10SPF0003-200	000-129-612		
Power Cable Assy.	MJ-A3SPF0013-035	000-129-613	1	Connector, fuse, 3.5 m
Hex Head Bolt	M10X25	000-862-308	4	For antenna unit
Dummy Film	03-118-1103-0	100-185-380	1 set	For display unit
Tapping Screw	5X20	000-802-081	4	For display unit
EMI Core	RFC-10	000-141-085	1	For antenna cable
Washer Head Screw	M4X15	000-881-448	1	For antenna cable
Fixing Band	03-146-0101-0	100-277-850	1	For antenna cable

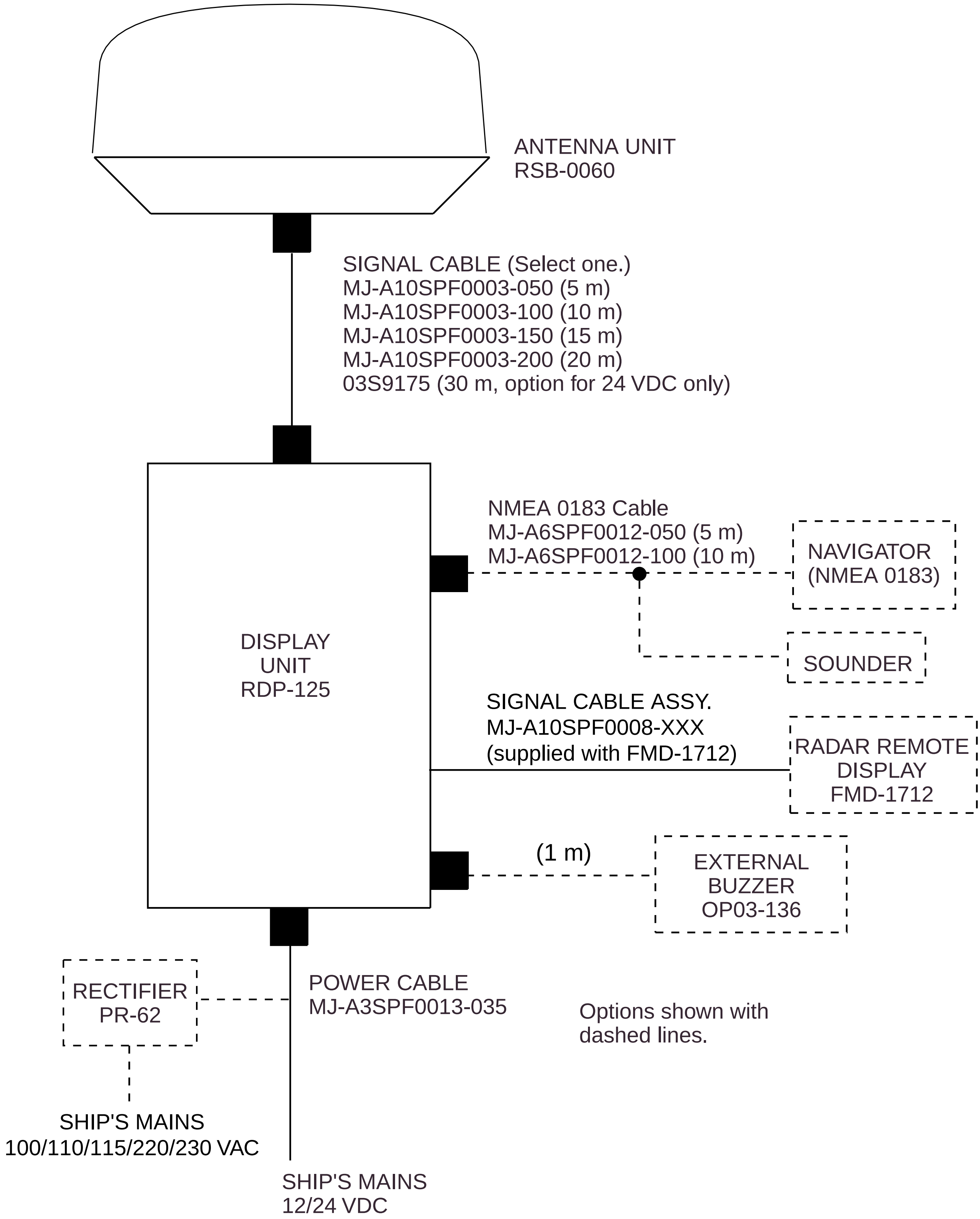
Spare Parts
SP03-09800 (000-085-441)

NAME	TYPE	CODE NO.	QTY	REMARKS
Fuse	FGBO-A 5A 125 VAC	000-549-064	2	For display unit

Optional Equipment

NAME	TYPE	CODE NO.	QTY	REMARKS
Cable Assy.	MJ-A6SPF0003-050	000-117-603	1	Connector at a end, 5 m
	MJ-A6SPF0009-100	000-125-236	1	Connector at a end, 10 m
Antenna Cable Assy.	03S9175	000-130-034	1	Connector at one end, 24 V spec. only.
Radome Mounting Bracket	OP03-93	008-445-080	1	For sailboat
External Buzzer	OP03-136	000-086-443	1	Connector at one end, 1 m
Rectifier	PR-62	000-013-484	1	100VAC
	PR-62	000-013-485		110VAC
	PR-62	000-013-486		220VAC
	PR-62	000-013-487		230VAC

SYSTEM CONFIGURATION



1. INSTALLATION

1.1 Antenna Unit Installation

Mounting considerations

When selecting a mounting location for the antenna unit keep in mind the following points.

- Install the antenna unit on the hardtop, radar arch or on a mast on an appropriate platform. (For sailboats, a mounting bracket is optionally available.) It should be placed where there is a good all-round view with, as far as possible, no part of the ship's superstructure or rigging intercepting the scanning beam. Any obstruction will cause shadow and blind sectors. A mast, for instance, with a diameter considerably less than the width of the antenna unit, will cause only a small blind sector. However, a horizontal spreader or crosstrees in the same horizontal plane would be a much more serious obstruction; place the antenna unit well above or below it.

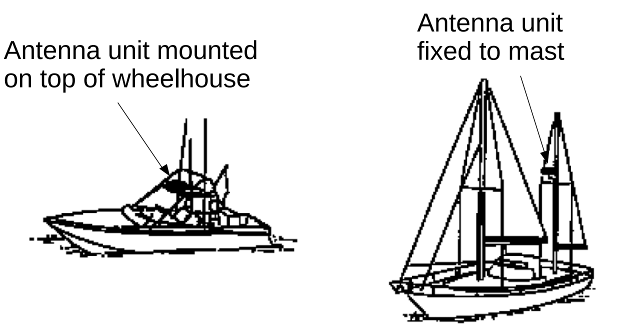


Figure 1 Typical antenna unit placement on powerboat and sailboat

- In order to minimize the chance of picking up electrical interference, avoid where possible routing the antenna cable near other electrical equipment onboard. Also avoid running the cable in parallel with power cables.
- The compass safe distance of 1.25 meters (standard compass) and 0.95 meters (steering compass) should be observed to prevent deviation of the magnetic compass.

Mounting on a platform

1. Remove mounting hardware at the bottom of the antenna unit; four each of hex bolts (M10X20), spring washers and flat washers. Save mounting hardware to use it to fix the antenna unit to the mounting platform later on.

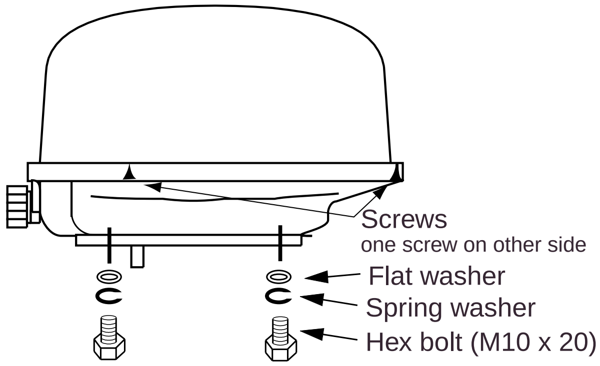


Figure 2 Antenna unit, showing location of mounting hardware

2. Unfasten three screws to remove the cover.
3. Construct a platform (wood, steel, or aluminum) of 5–10 mm in thickness whose dimensions are as shown in Figure 4. Fasten the platform to the mounting location. Next, position the base so the cable entrance faces the stern direction and the vent tube is extending downward through the hole for the vent tube.

Note: When drilling holes in the platform, be sure they are parallel with the fore and aft line.

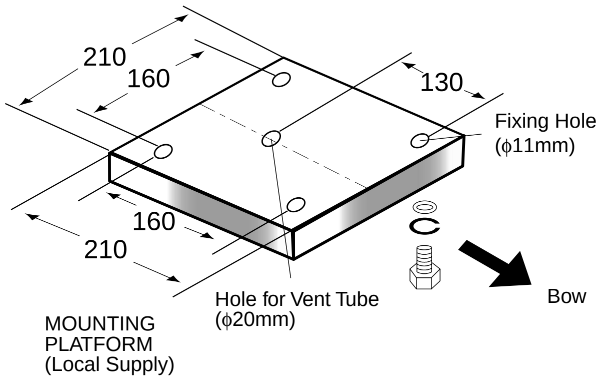


Figure 3 Dimensions of antenna platform

4. Using the hex bolts, flat washers and spring washers removed at step 1, fasten the base to the platform. **The torque should be between 19.6-24.5 N•m.**

Note: Longer hex bolts (M10X25) are supplied with the installation materials. Use them instead of the hex bolts removed earlier if the mounting platform is very thick.

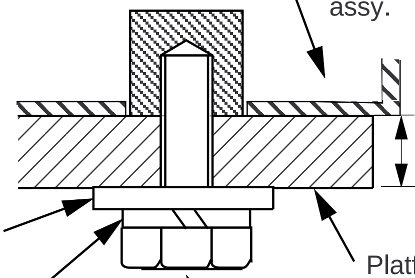


Figure 4 How to fasten the base to platform

5. Unfasten the cable of the rotation detector from the cable clamp.

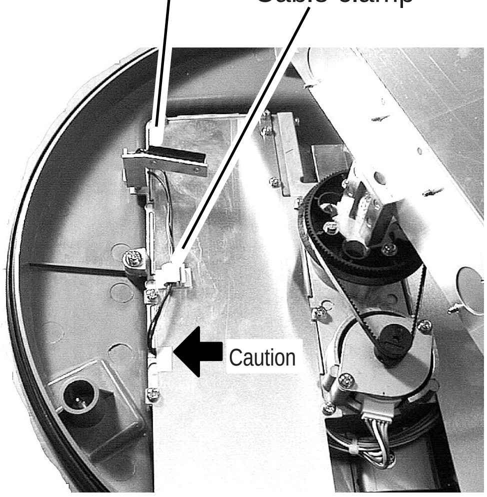


Figure 5 Antenna unit, inside view

Caution: Be careful not to pinch the rotation detector cable when remounting the shield plate.

6. Unfasten 11 screws to dismount the shield plate.

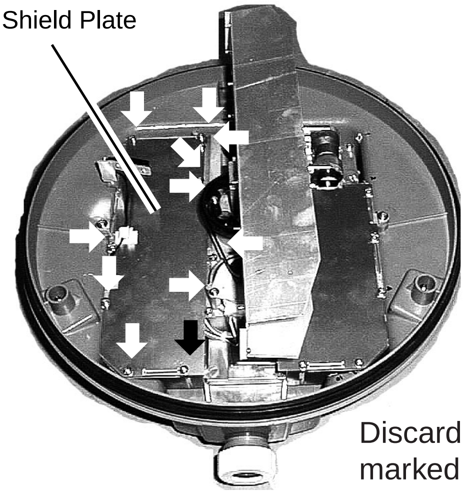


Figure 6 Antenna unit, inside view

7. Pass the antenna cable with connector through the gasket and cable clamp, and then tighten cable gland.
Be sure the shrink tubing on the antenna cable is not covered by the gasket.

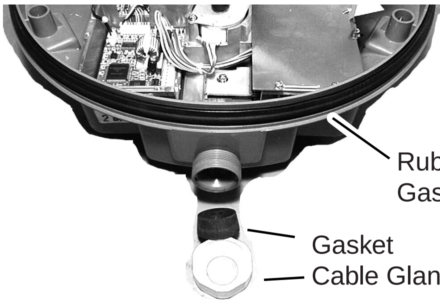


Figure 7 Antenna unit, inside view

8. Referring to Figure 8, fasten the shield cable to a screw (M4x 10) on the chassis to ground the unit.

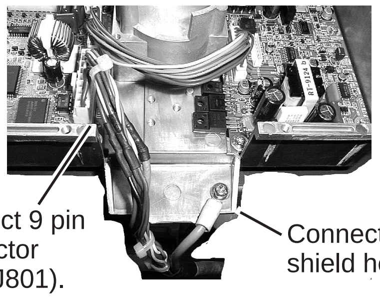


Figure 8 How to connect the antenna cable to the antenna unit

9. Attach EMI Core (supplied) to antenna cable. Set the fixing band to the EMI core.

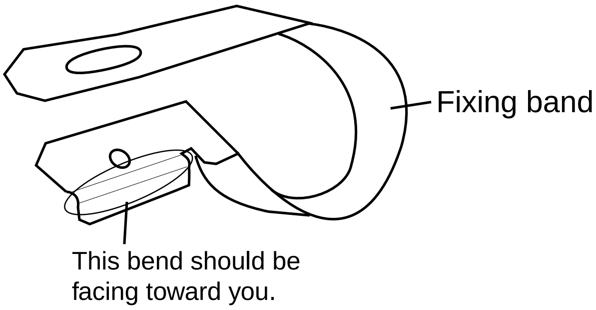


Figure 9 Fixing band

10. Referring to Figure 8, connect the 9-pin connector of the antenna cable to J801.
11. Refasten the shield plate with 10 screws. Be sure not to pinch cable from the rotation detector with the shield plate. See "Caution" in Figure 5 for details.
12. Fasten the Fixing band with Screw (supplied).

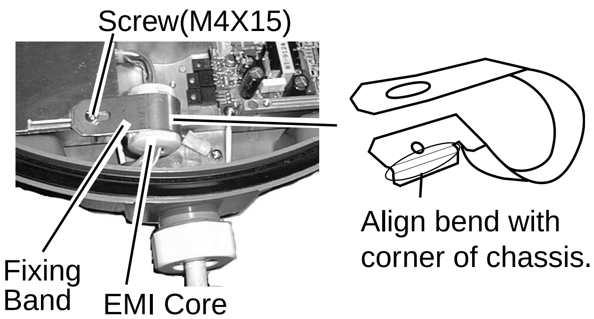


Figure 10 How to fix the EMI Core

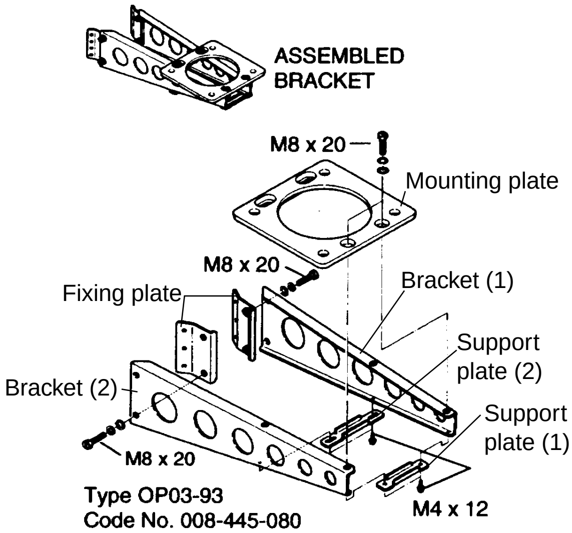
13. Confirm that the rubber gasket is properly positioned and then tighten the fixing screws for the cover. Refer to Figure 7 for positioning of rubber gasket.

Mounting using the optional mounting bracket

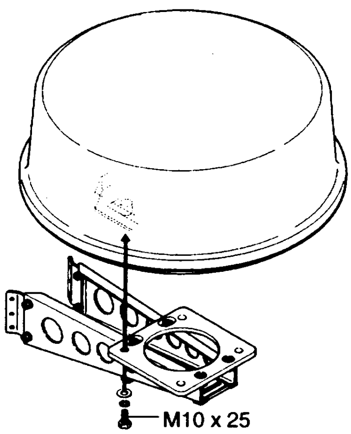
A mounting bracket for fastening the antenna unit to a mast on a sailboat is optionally available (Type OP03-93, Code No.008-445-080).

Name	**Type**	**Code No.**	**Qty**
Hex. bolt	M4X12	000-804-725	4
Hex. bolt	M8X20	000-805-707	8
Mounting plate	03-018-9001-0	100-206-740	1
Support plate (1)	03-018-9005-0	100-206-780	1
Support plate (2)	03-018-9006-0	100-206-790	1
Bracket (1)	03-028-9101-0	100-206-810	1
Bracket (2)	03-028-9102-0	100-206-820	1
Fixing plate	03-028-9103-0	100-206-830	2

1. Remove mounting hardware at the bottom of the antenna base. You may discard the hardware. Assemble the mounting bracket and fasten it to a mast. Fasten the antenna unit to the bracket.



(A) Assembling the mounting bracket



(B) Fastening antenna to mounting bracket

Figure 11 How to assemble and mount the optional mounting bracket

2. Refer to previous steps 4-12 in "Mounting on a platform".

1.2 Display Unit Installation

Mounting considerations

When selecting a mounting location for the display unit keep in mind the following points.

- Locate the display unit in a position where you can view and operate it conveniently.
- The orientation of the display unit should be so the radar screen is viewed while the operator is facing in the direction of the bow. This makes determination of your position much easier.
- The display unit is designed and constructed to be splashproof, thus it can be installed outdoors. If it is to be installed outdoors, we recommend installing it an enclosed cabinet, for maximum protection against the marine environment.
- Even though the picture is quite legible even in bright sunlight, keep the display unit out of direct sunlight or at least shaded because of heat that can build up inside the cabinet.
- The temperature and humidity of the mounting location should be stable and moderate. No LCD can provide adequate contrast if the ambient temperature is too low or too high.
- Make sure you allow enough clearance both to get to the connectors behind the unit and to allow you to get your hands in on both sides to loosen or tighten the mounting knobs. Make sure you leave at least a foot or so of "service loop" in cables behind the unit for servicing or easy removal of the connectors.
- The compass safe distance of 0.65 meters (standard compass) and 0.5 meters (steering compass) should be observed to prevent deviation of the magnetic compass.

Mounting

The display unit can be mounted on a tabletop, the overhead, or flush mounted in a panel.

1. Fix the hanger to the mounting location with four tapping screws (supplied).
2. Fit the knob bolts to the display unit.
3. Cover the unused bolt holes with the dummy films supplied.
4. Install the display unit in the hanger. Tighten the knob bolts securely.

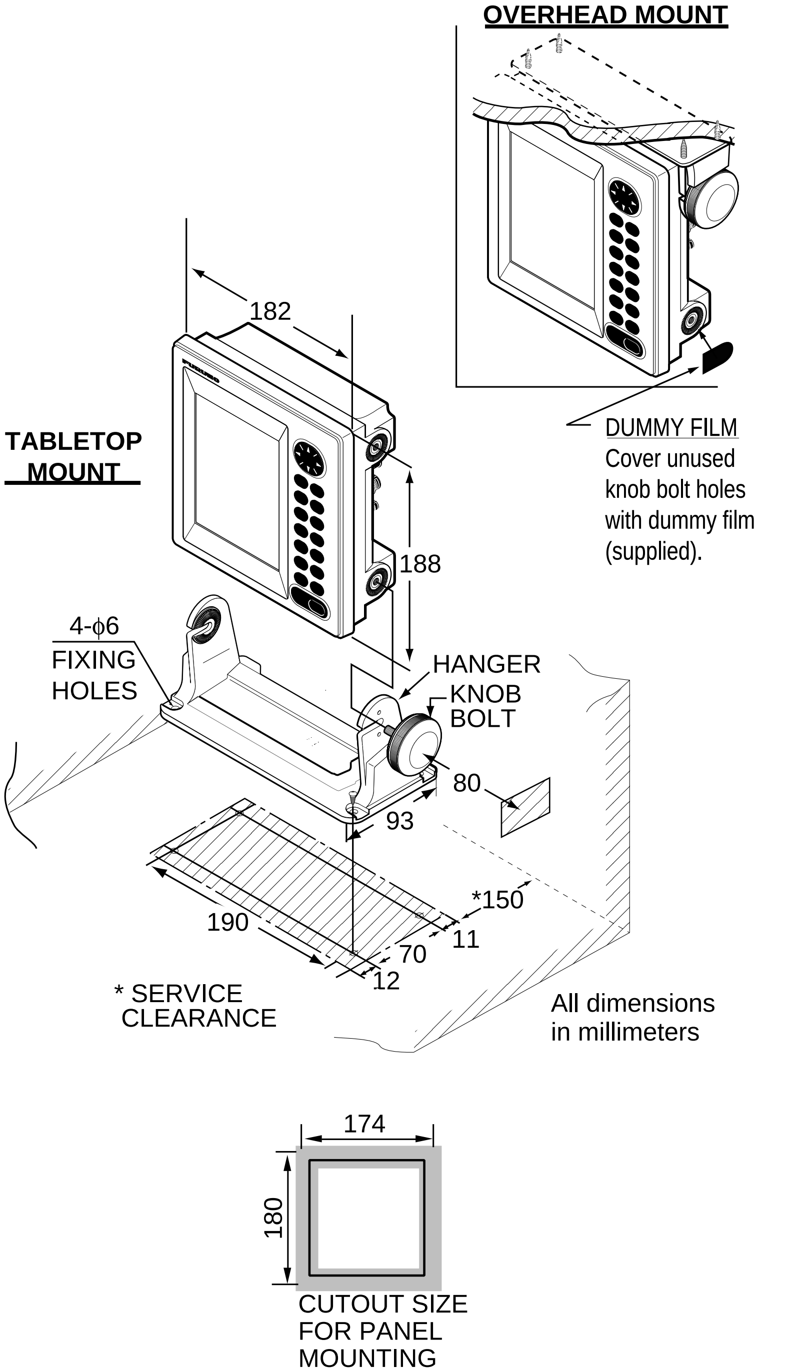


Figure 12 Mounting dimensions of display unit

2. WIRING

2.1 Connections

Connect the antenna cable, the power cable and the ground wire as shown in Figure 13.

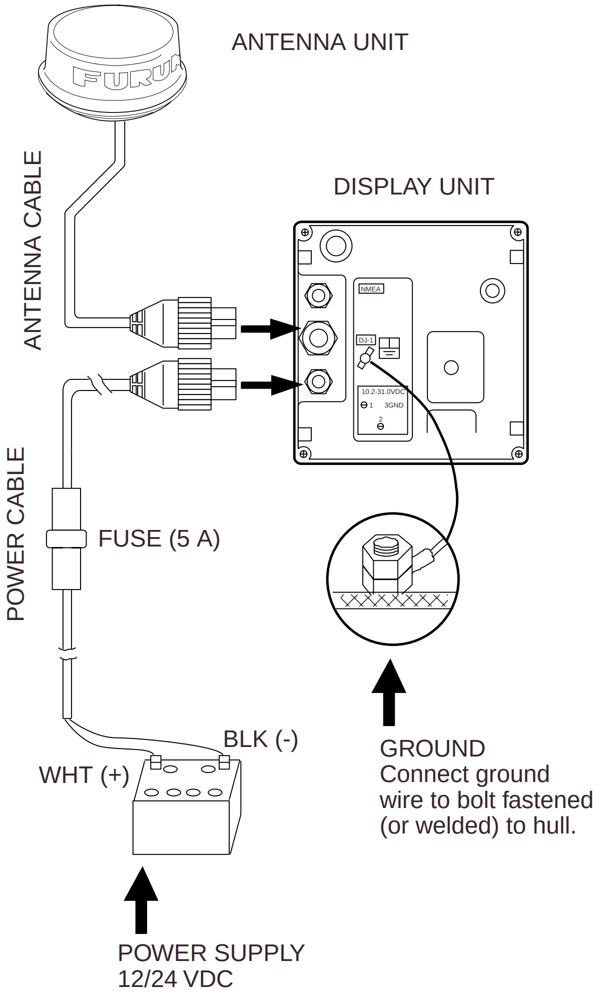


Figure 13 Connections

Connection of external equipment

Navigator/echosounder

This radar can receive the following NMEA 0183 format data sentences from a navigator or echosounder:

GLL: Geographic position - Lat/Long
BWR: Bearing and Distance to Waypoint - Rhumb line
BWC: Bearing and Distance to Waypoint
GLC: Geographic Position - Loran-C
GTD: Geographic Position - Time Difference
RMA: Recommended Minimum Specific Loran-C Data
RMB: Recommended Minimum Navigation Information
RMC: Recommended Minimum Specific GPS/Transit Data
VTG: Track Made Good and Ground Speed
MTW: Water Temperature
DBT: Depth Below Transducer
DBS: Depth Below Surface
DPT: Depth
GGA: GPS - Rx status, L/L

NMEA connection

You will need an NMEA cable to connect a video sounder or a navigator. Connect it to the NMEA connector at the rear of the radar display unit as shown below.

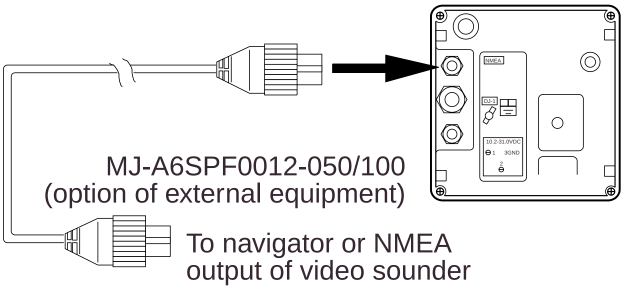


Figure 14 Navigator connection

Note: Do not use a cross wiring-type NMEA cable which has connectors at both ends (for example, MJ-A6SPF0012-050). Miswiring can result when the one of the connectors is removed to make the connection.

To connect both a video sounder and a navigator, use NMEA cable MJA6SPF0003-050/MJ-A6SPF0009-100 (option) and solder them as shown below.

Note 1: Tape cables to prevent short.

Note 2: You may cut a NMEA cable which has connectors at both ends. However, do not modify waterproof connector of NMEA cable.

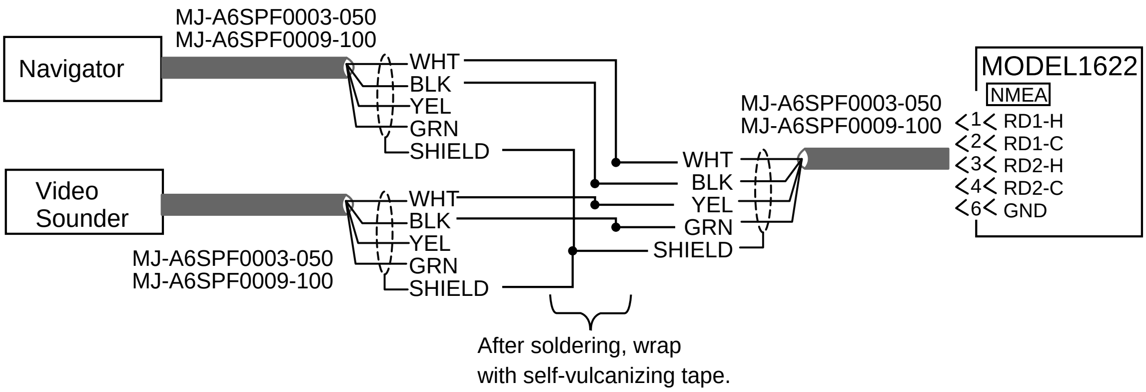


Figure 15 Connection of video sounder and navigator cables

To connect equipment whose NMEA output uses other than a FURUNO 6 pin NMEA connector, use NMEA cable type MJ-A6SPF0003-050/MJ-A6SPF0009-100 to make the connection.

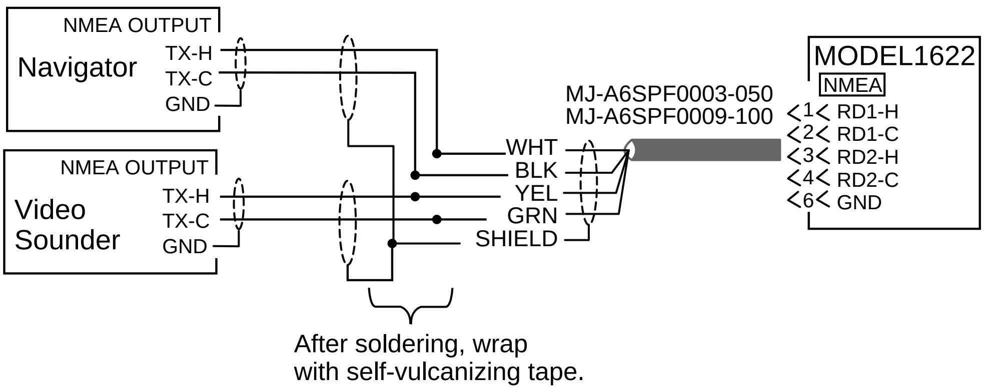


Figure 16 Connection of video sounder and navigator cables using NMEA cable type MJ-A6SPF0003-050/MJ-A6SPF0009-100

External buzzer

Access J6 on the DU Board as shown in Figure 16. Plug in the connector of the external buzzer at J6. Seal the hole with sealing compound. Fix the buzzer by two tapping screws.

External buzzer
Type: OP03-136
Code No.: 000-086-443

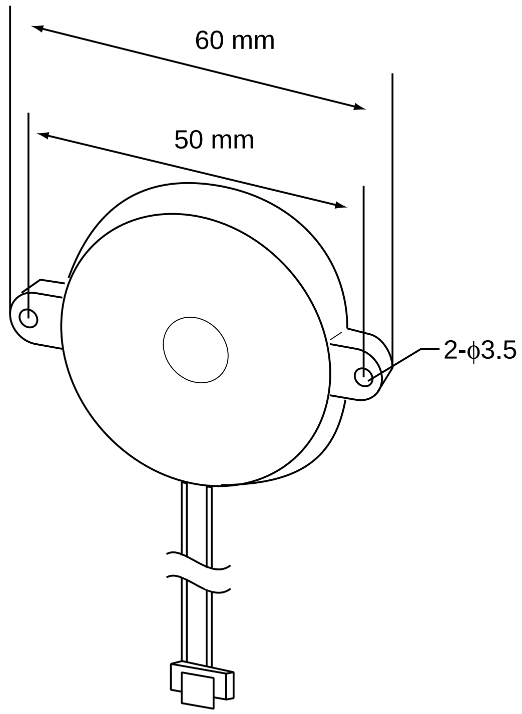
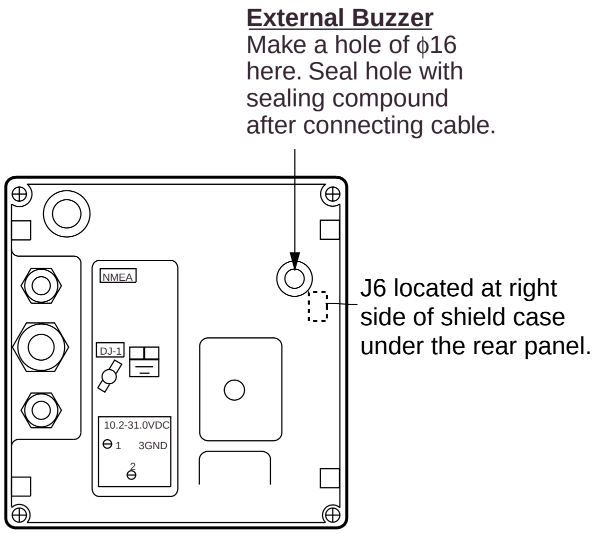


Figure 17 External buzzer



Note: Use hammer and appropriate metal rod to make hole.

Figure 18 Display unit, rear view

3. ADJUSTMENTS

3.1 Installation Check

After installing the system it is a good idea to check it for proper installation, following the checklist provided below.

- Cable gland is facing toward the stern.
- Four fixing bolts securing the antenna unit are securely tightened.
- The antenna cable is waterproofed at the base of the antenna unit.
- The antenna cable is securely retained against the mast or mounting and is free of interference from running rigging.
- The cable gland on the deck or bulkhead is waterproofed, if provided.
- Connectors of external equipment are securely plugged into the radar display unit.
- The power connections to the battery are of correct polarity.

3.2 Exchanging Display Unit of Previous Model

When exchanging the display unit of the MODEL 1621/1621 MARK-2 with that of the MODEL 1622, it is necessary to maintain the magnetron warmup time. This should be done with the radar in stand-by.

1. Press ▲ and ▼ together for about 10 seconds to show the display shown in Figure 19.

PROGRAM NO 03591610XX		SEL MENU BY ◀/▶ KEY		
1	MODEL	M1622	M1621/M2	
2	DISPLAY	MAIN	DEMO	
NAV DATA (NMEA 0183)				
GLL	BWR	BWC	GLC	GTD
RMA	RMG	RMC	VTG	MTW
DBT	DBS	DPT	GGA	

Figure 19 Maintenance menu

2. Select MODEL by ▲.

   M1622: 1 minute.
   M1621/M2: 1minute and 30 seconds.

3. Select M1621/M2 by ▶.
4. Press the [MENU] key to close the menu.

3.3 Adjustments

Do the following in order to adjust the radar.

1) Adjustment of picture

1. Press the [POWER] key on the display unit. The display should light. In approximately one minute, ST-BY appears at the screen center.
2. When ST-BY appears press the [TX] key. The radar will start transmitting, and you will probably see some targets, even though the radar is not yet properly adjusted.
3. Adjust the sensitivity to display a small amount of noise on the screen.
4. Press the [–] key several times to select the minimum range. Adjust the STC to display nearby radar targets clearly on the screen. Too much STC action will eliminate small targets, and too little STC action will cause the screen to be so full of targets and noise that it is hard to determine which target is which as compared to visual sightings.

2) Heading alignment

You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading mark (zero degrees).

In practice, you will probably observe some small error on the display because of the difficulty in achieving accurate initial positioning of the antenna unit. The following adjustment will compensate for this error, up to ±30 degrees.

1. Identify a suitable target (for example, ship or buoy) at a range between 0.125 to 0.25 miles, preferably near the heading mark. To minimize error, keep echoes in the outer half of the picture by changing the range.

2. Press and hold down ◀ and ▶ together (about 10 seconds) to display the installation menu.

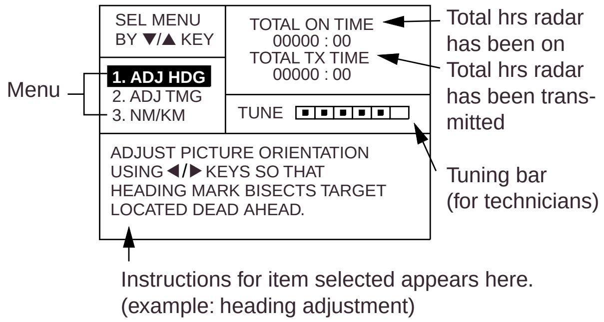


Figure 20 Installation menu

3. Select ADJ HDG. Your display should now look something like the one shown in Figure 21.

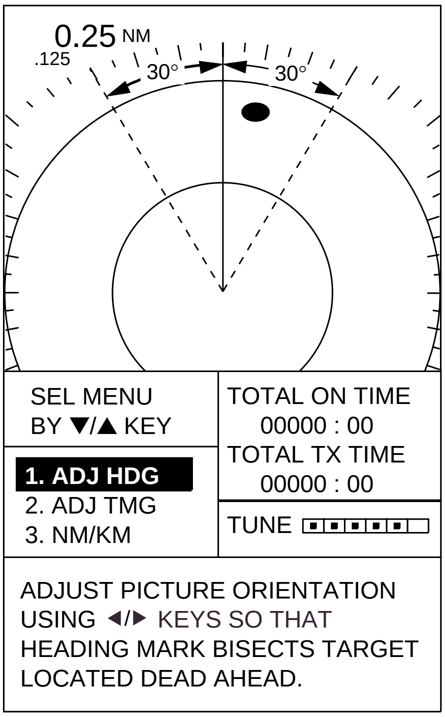


Figure 21 Display for adjustment of heading

4. Press ◀ or ▶ to bisect the target selected at step 1 with the heading marker.

5. Press MENU.

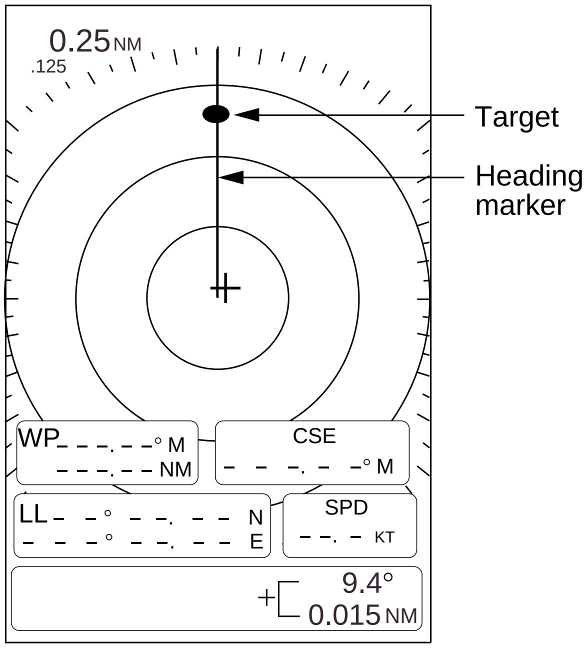


Figure 22 How to adjust heading

6. As a final test, move the boat towards a small buoy and confirm that the buoy shows up dead ahead on the radar when it is visually dead ahead.

3) Sweep timing

This adjustment ensures proper radar performance, especially on short ranges. The radar measures the time required for a transmitted echo to travel to the target and return to the source. The received echo appears on the display based on this time. Thus, at the instant the transmitter is fired, the sweep should start from the center of the display (sometimes called sweep origin.)

A trigger pulse generated in the display unit goes to the antenna unit through the antenna cable to trigger the transmitter (magnetron). The time taken by the signal to travel up to the antenna unit varies, depending largely on the length of signal cable. During this period the display unit should wait before starting the sweep. When the display unit is not adjusted correctly, the echoes from a straight local object (for example, a harbor wall or straight pier) will not appear with straight edges – namely, they will be seen as pushed out or pulled in near the picture center. The range of objects will also be incorrectly shown.

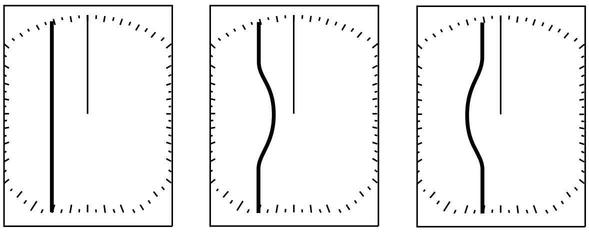


Figure 23 Examples of improper and correct sweep timings

1. Transmit the radar on a range between 0.125 and 0.5 nm and adjust the sensitivity and STC.
2. Visually select a straight echo (harbor wall, straight pier).
3. Select ADJ TMG on the menu.

SEL MENU BY ▼/▲ KEY	TOTAL ON TIME 00000 : 00 TOTAL TX TIME 00000 : 00
1. ADJ HDG 2. ADJ TMG 3. NM/KM	TUNE ▪▪▪▪▪
IDENTIFY STRAIGHT TARGET SUCH AS BREAKWATER. MAKE ITS ECHO STRAIGHT ON SCREEN BY USING ◀/▶ KEYS.	

Figure 24 Installation menu, ADJ TMG selected

4. While looking at the target selected at step 2, straighten it by pressing ▶ if it is pulled inward, or ◀ if it is pushed outward.

4) Unit of range measurement for VRM and cursor

The unit of range measurement for the VRM and the cursor may be selected to nautical mile or kilometers as follows:

1. Select NM/KM on the menu.

SEL MENU BY ▼/▲ KEY	TOTAL ON TIME 00000 : 00 TOTAL TX TIME 00000 : 00
1. ADJ HDG 2. ADJ TMG 3. NM/KM	TUNE ▪▪▪▪▪
(RANGE UNIT) PRESS ◀/▶ KEYS TO SELECT NAUTICAL MILE OR KILOMETER AS THE UNIT OF RANGE.	

Figure 25 Installation menu, NM/KM selected

2. Select unit of range desired.
3. Press the [MENU] key to close the installation menu.

3.4 Adjustments for Technicians

1) Magnetron heater voltage

Magnetron heater voltage is formed at the MD Board of the antenna unit and preadjusted at the factory for use with any length of signal cable. Therefore no adjustment is required. However, verify heater voltage as follows:

Note: Turn the power on when measuring magnetron heater voltage.

1. Dismount the shield plate.

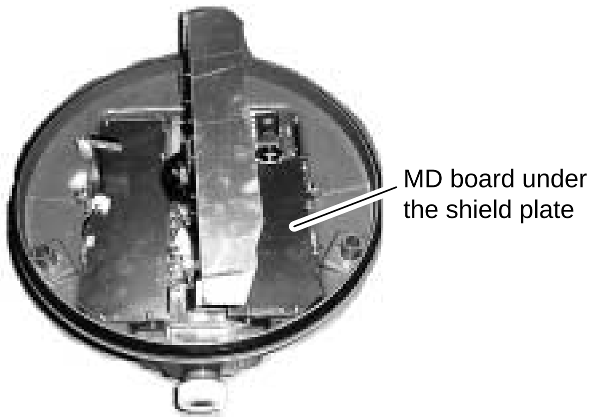


Figure 26 MD board

2. Turn on the power. Do not transmit the radar.
3. Connect a multimeter, set to 10 V DC range, between #6(+) and #4(-) of test point TP804 on the MD Board in the antenna unit.
4. Confirm that the multimeter shows 8.0 V ±0.1 V. If it does not, adjust potentiometer VR801 on the MD Board.

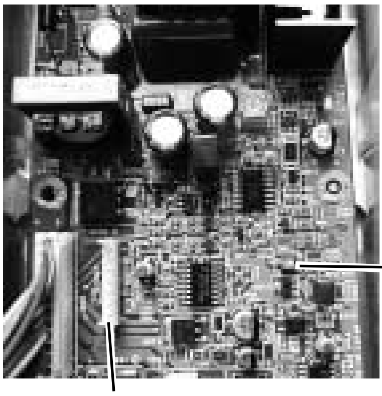


Figure 27 Antenna unit, inside view

2) Radar function

This radar can function as the main radar or a demonstration model. displaying internally generated radar echoes.

1. Set the radar in stand-by.
2. Press and hold down ▲ and ▼ together (about 10 seconds) to display the maintenance menu.

PROGRAM NO 03591610XX		SEL MENU BY ◄/► KEY		
1	MODEL	M1622	M1621/M2	
2	DISPLAY	MAIN	DEMO	
NAV DATA (NMEA 0183)				
GLL	BWR	BWC	GLC	GTD
RMA	RMG	RMC	VTG	MTW
DBT	DBS	DPT	GGA	

Figure 28 Maintenance menu

3. Select MAIN or DEMO from the DISPLAY field. (MAIN, Main radar display, DEMO, demonstration display.)
4. Press the [MENU] to close the menu.

Note: Disconnect the antenna cable to use as demonstration model.

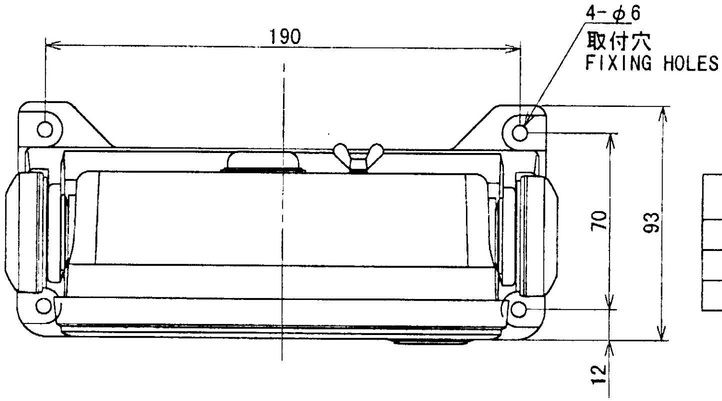
3.5 I/O Data Confirmation

You can confirm NMEA input from a navigator or echosounder. Follow the procedure shown in 2) Radar function to display the maintenance menu. NMEA sentences being input are shown in reverse video.

3.6 Restoring Default Settings

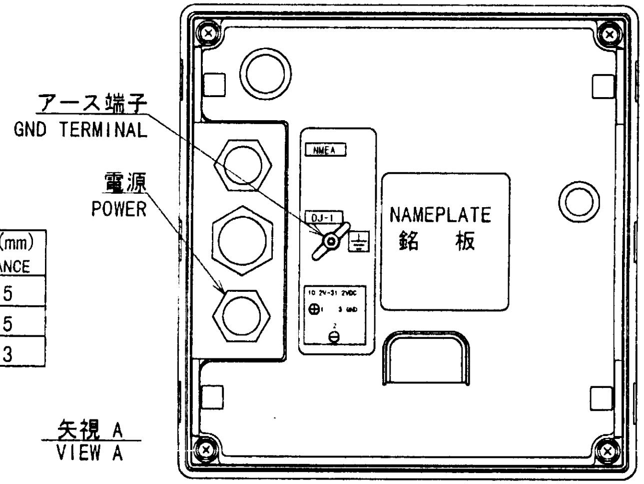
All default menu settings can be restored by turning on the power while pressing and holding down [MENU] and &.

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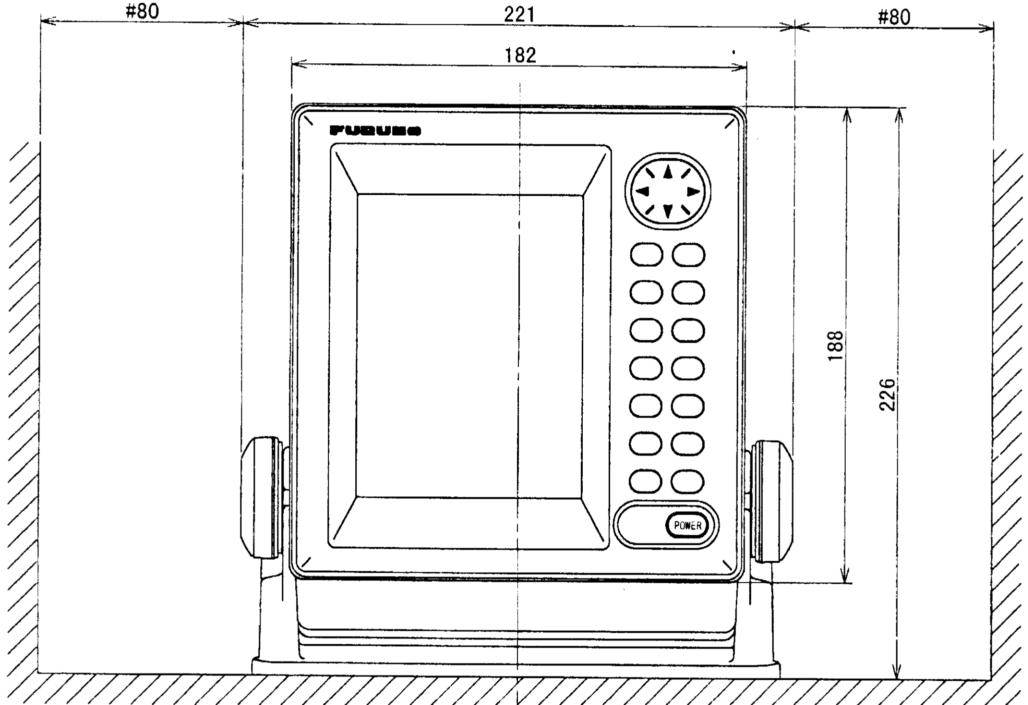


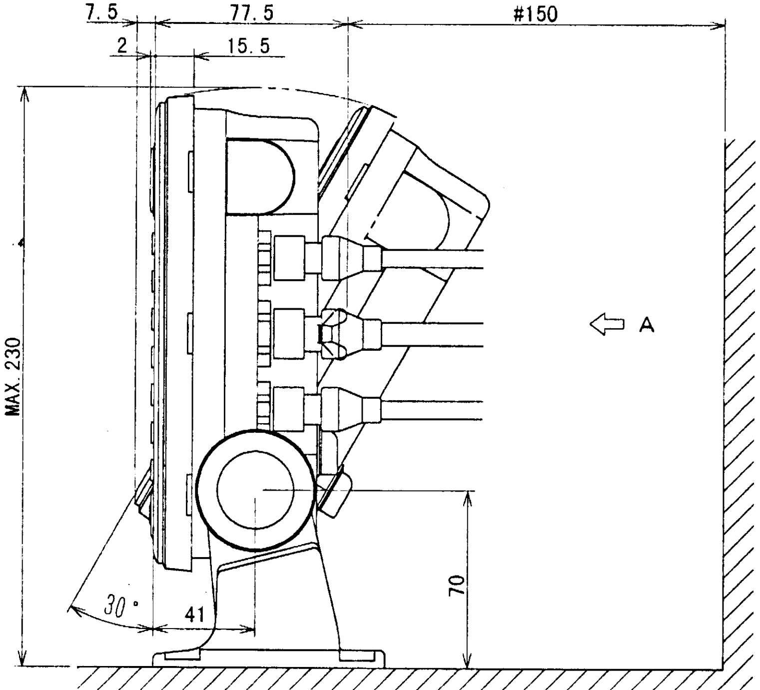
寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

表1
TABLE 1



矢視 A
VIEW A





注記　1）指定なき寸法公差は表1による。
　　　2）#：推奨する最小サービス空間寸法。

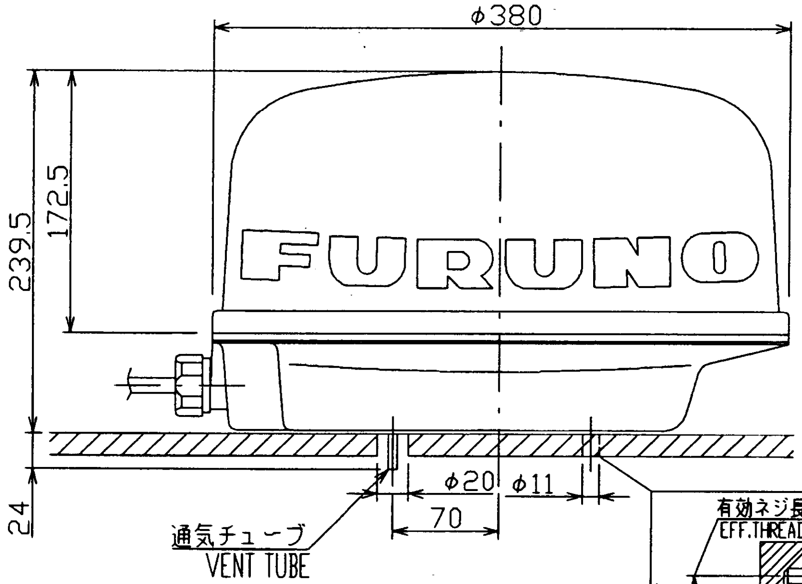
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
　　 2. #: RECOMMENDED SERVICE CLEARANCE.

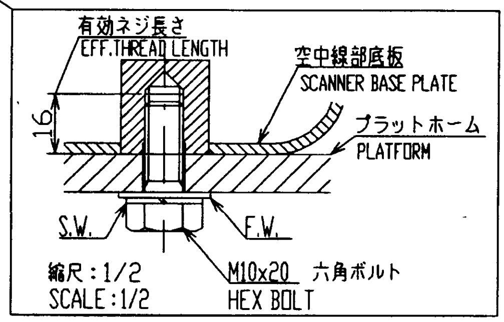
DRAWN June 20 '99 T.Yamasaki		TITLE	RDP-116/125
CHECKED Jun 21 '99 K.Kusuzaki		名称	指示部
APPROVED Jun 21 '99 K.Kusuzaki	MODEL1622 MODEL1621 MARK-2		外寸図
SCALE 1/3	MASS 1.4 kg	NAME	DISPLAY UNIT
DWG. No. C3428-G01- C	03-135-1000-G0		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

表１　TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3





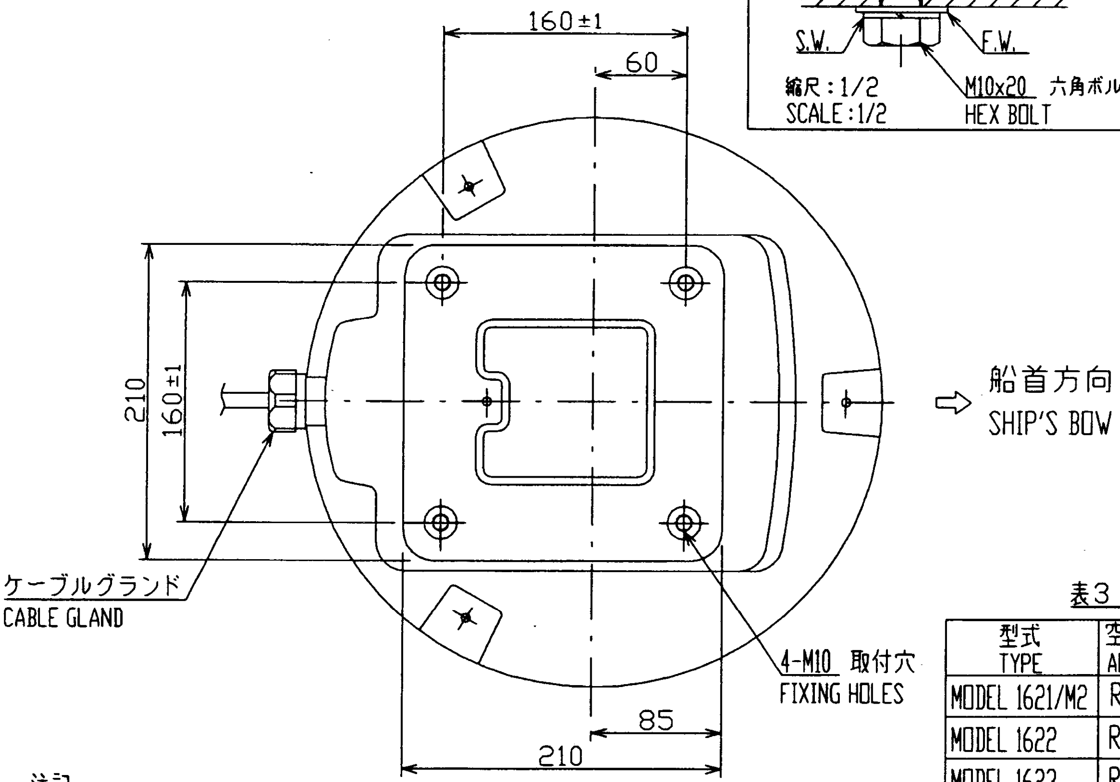


表３　TABLE 3

型式 TYPE	空中線型式 ANT. TYPE	質量 (kg) MASS
MODEL 1621/M2	RSB-0060	5.2
MODEL 1622	RSB-0060	4.5
MODEL 1623	RSB-0093	4.5

注記
1）指定なき寸法公差は表１による。
2）通気チューブ及びケーブルグランドは出荷時に取付済。
3）コンパス安全距離を表２に示す。

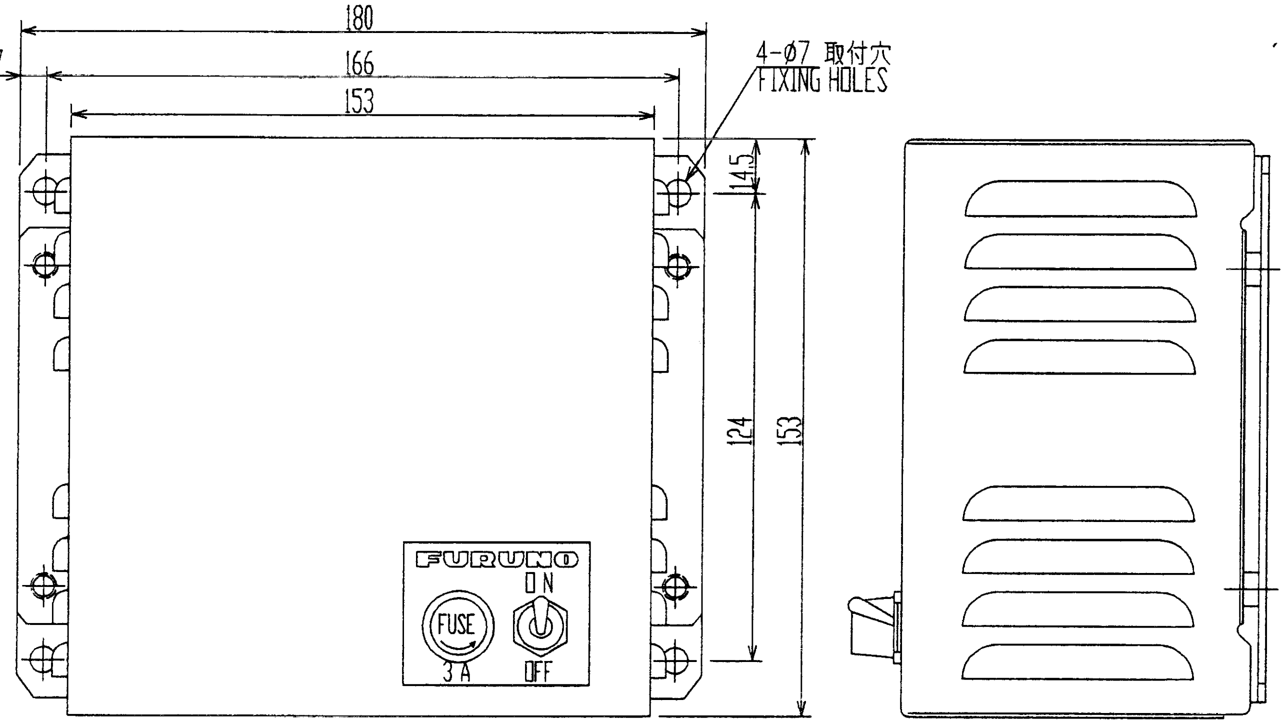
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. VENT TUBE AND CABLE GLAND ARE FITTED AT FACTORY.
3. TABLE 2 INDICATES COMPASS SAFE DISTANCES.

表2　TABLE 2

	M1621	M1621 M2	M1622/1623
スタンダード STANDARD	1.7 m	2.0 m	1.25 m
ステアリング STEERING	1.3 m	1.5 m	0.95 m

DRAWN Sep. 5 '02 T.YAMASAKI		TITLE	RSB-0060/0093
CHECKED Sep.5 '02 Y.Kishi		名称	空中線部
APPROVED Sep.5 '02 Y.Kishi	MODEL 1621/1621M2 MODEL 1622/1623		外寸図
SCALE 1/5 — MASS 表３参照 SEE TABLE 3		NAME	SCANNER UNIT
DWG.No. C3378-G02-H	03-118-3000-0		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



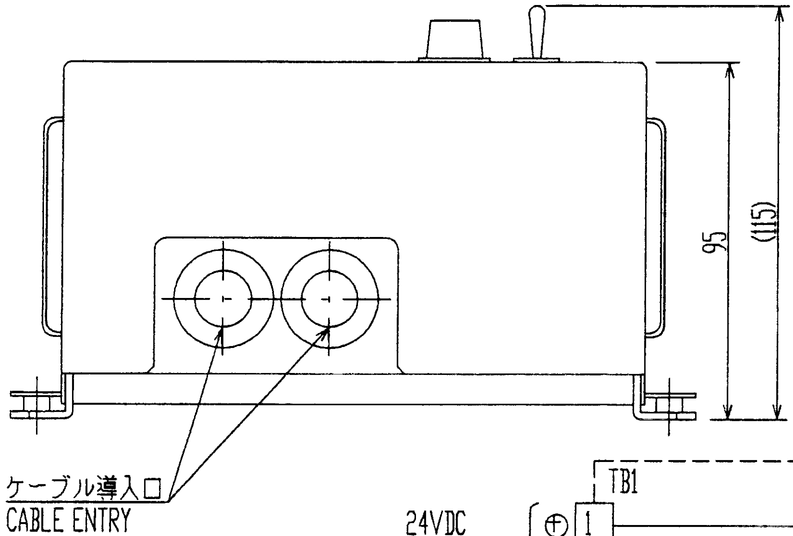
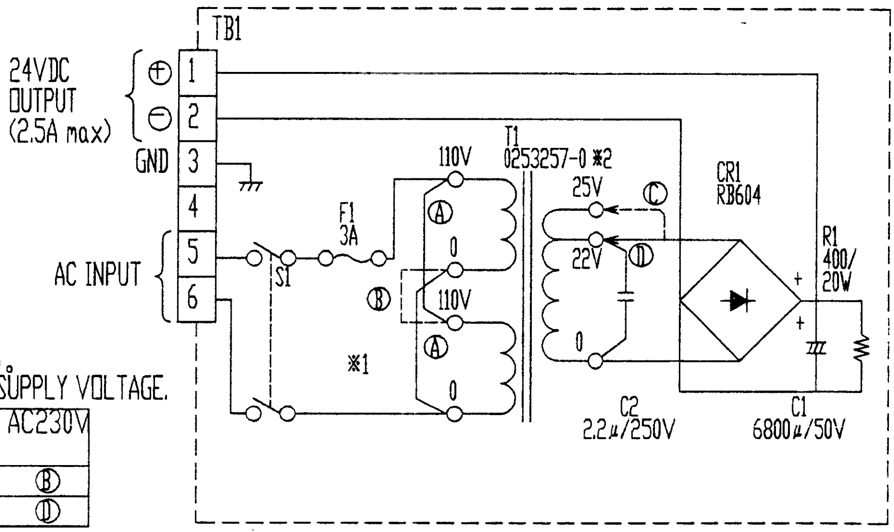


表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 < L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3



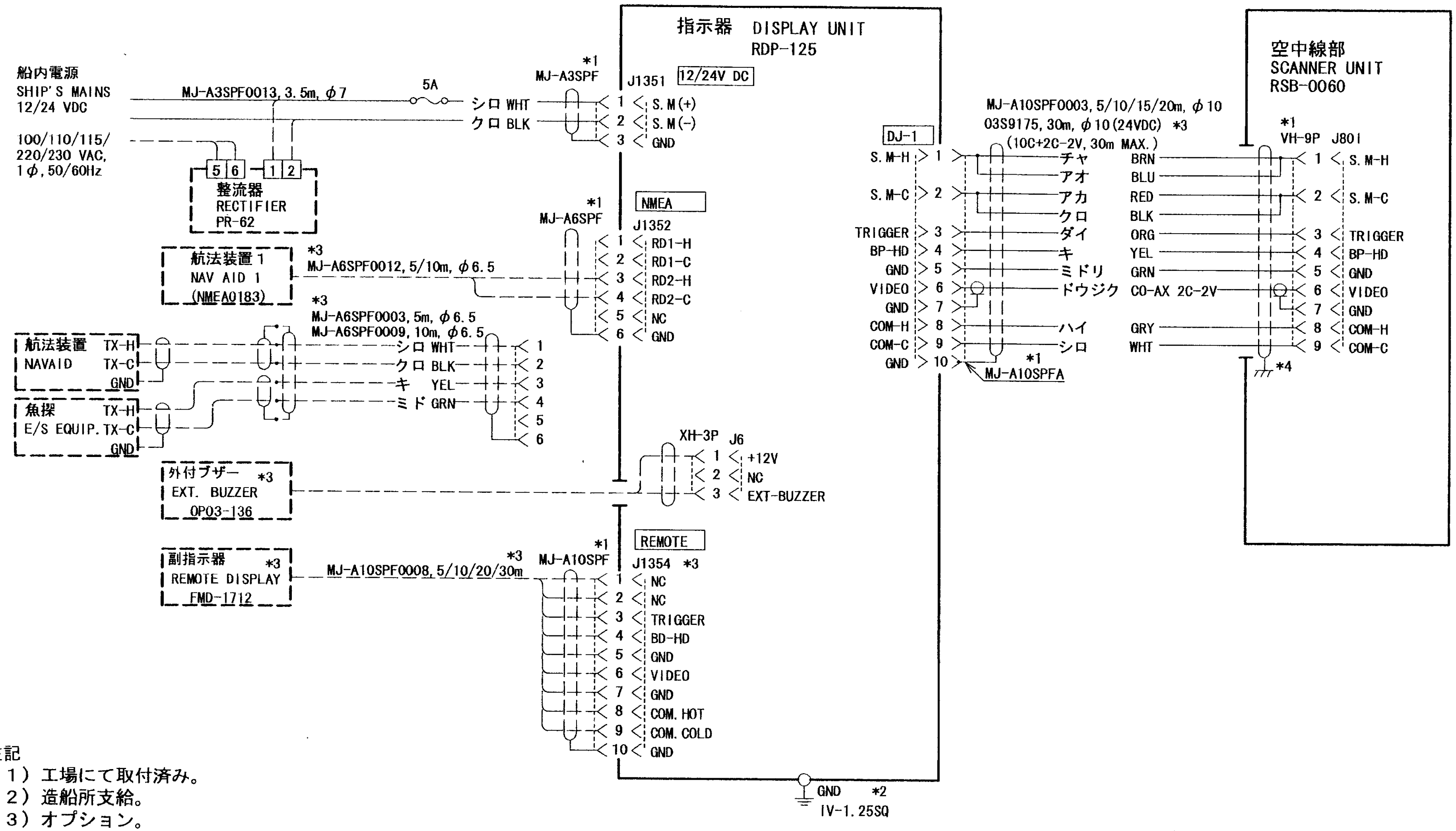
入力電圧に応じて接続を変更して下さい。
CHANGE TAP CONNECTIONS DEPENDING ON SUPPLY VOLTAGE.

	AC100V	AC110/115V	AC220V	AC230V
※1	Ⓐ	Ⓐ	Ⓑ	Ⓑ
※2	Ⓒ	Ⓓ	Ⓓ	Ⓓ

DRAWN Sep. 14 '01 T.YAMASAKI	TITLE PR-62
CHECKED	名称 整流器
APPROVED	外寸図
SCALE 1/2 MASS 3 kg ±10%	NAME RECTIFIER
DWG.No. C5003-034- E	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

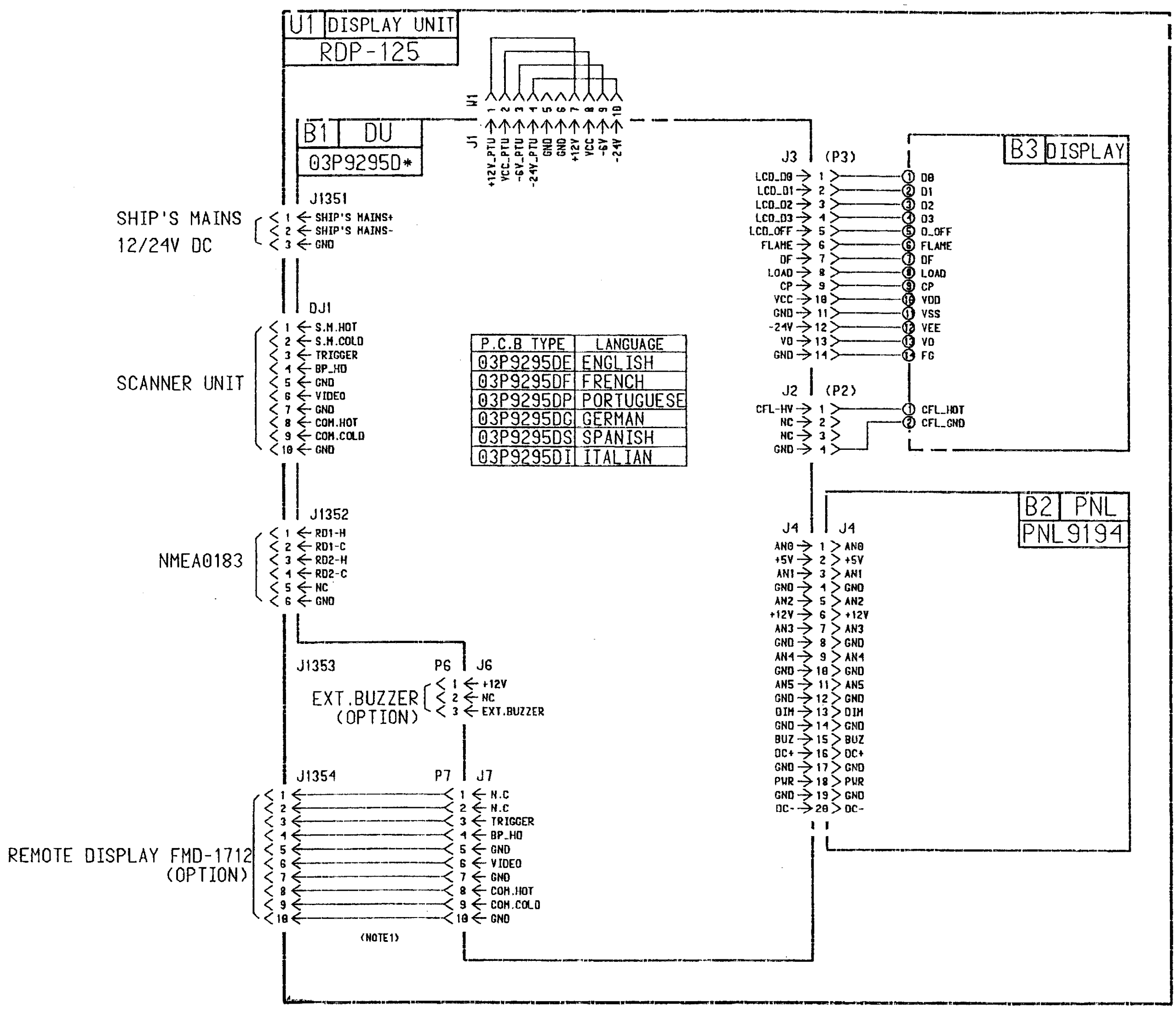


注記
＊1）工場にて取付済み。
＊2）造船所支給。
＊3）オプション。
＊4）空中線部のシールドは完全にアースする。
＊5）航法データは２系統接続可能。（ケーブル加工必要）

NOTE
*1. FITTED AT FACTORY.
*2. SHIPYARD SUPPLY.
*3. OPTION.
*4. GROUND EFFECTIVELY AT SCANNER UNIT.
*5. 2WAY DATA INPUT AVAILABLE. (CABLE MODIFICATION NEEDED)

DRAWN Oct. 22 '01 T. YAMASAKI		TITLE	MODEL 1622
CHECKED Oct 22 '01 T. Kimura		名称	船舶用レーダー
APPROVED Oct 22 '01 T. Kimura			相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWG. No. C3452-C01- F	03-146-6001-3		INTERCONNECTION DIAGRAM

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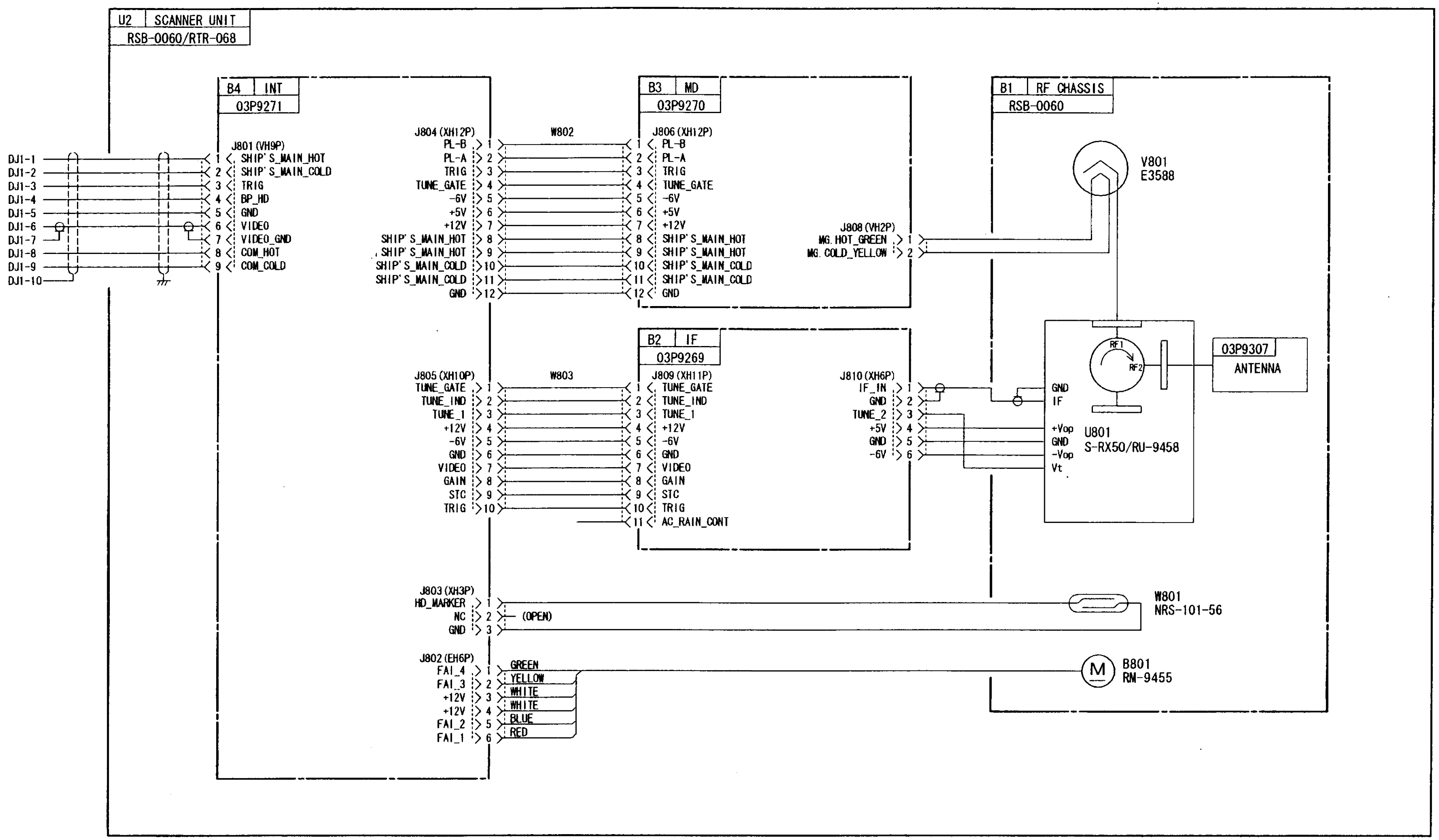


P.C.B TYPE	LANGUAGE
03P9295DE	ENGLISH
03P9295DF	FRENCH
03P9295DP	PORTUGUESE
03P9295DG	GERMAN
03P9295DS	SPANISH
03P9295DI	ITALIAN

(NOTE1) CONNECTOR ASSY SUPPLIED WITH FMD-1712.

DRAWN Jan.23 '01 T.YAMASAKI		TYPE	RDP-125
CHECKED Jan 23 '01 Y.Kim		名称	指示部
APPROVED Jan 23 '01 Y.Kim	MODEL1622		回路図
SCALE / MASS kg	APPLICABLE TO; (MODEL) BLOCK NO.	NAME	DISPLAY UNIT
DWG NO. C3452-K02- B	03-146-6002- 2		SCHEMATIC DIAGRAM

FURUNO



DRAWN Sep. 4 '02 T.YAMASAKI			TITLE	RSB-0060-068
CHECKED Sep. 4 '02 Y.Kimura			名 称	空中線部（総合）
APPROVED Sep. 4 '02 Y.Kimura		MODEL 1622		回路図
SCALE	MASS kg		NAME	SCANNER UNIT (GENERAL)
DWG No.	C3452-K01- E	03-146-6003-7		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.